510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
DEVICE ONLY TEMPLATE

A. 510(k) Number:
k032861

B. Analyte:
Moxifloxacin at 0.25 – 4 ug/ml AST

C. Type of Test:
Quantitative growth based detection algorithm using optics light detection

D. Applicant:
bioMerieux, Inc.

E. Proprietary and Established Names:
VITEK®2 Gram Negative Moxifloxacin

F. Regulatory Information:

1. Regulation section:
   866.1645 Short-Term Antimicrobial Susceptibility Test System
2. Classification:
   II
3. Product Code:
   LON System, Test, Automated, Antimicrobial Susceptibility, Short Incubation
4. Panel:
   83 Microbiology

G. Intended Use:

1. Intended use(s):
   The VITEK®2 Antimicrobial Susceptibility Test (AST) is intended to be used with the VITEK®2 System for the automated quantitative or qualitative susceptibility testing of isolated colonies for most clinically significant aerobic gram-negative bacilli, *Staphylococcus spp*., *Enterococcus spp*., *Streptococcus agalactiae*, and *S. pneumoniae*.

   The VITEK®2 Gram Negative Susceptibility Card is intended for use with the VITEK®2 System in clinical laboratories as an *in vitro* test to determine the susceptibility of clinically significant aerobic gram-negative bacilli to antimicrobial agents when used as instructed in the Online Product Information.
2. Indication(s) for use:
   The indication will include the testing of moxifloxacin at concentrations of 0.25, 1, and 4 for reporting of results between $\leq$0.25 – $\geq$8 ug/ml for the intended *Enterobacteriaceae* group using the VITEK®2 System.

3. Special condition for use statement(s):
   Not applicable
4. Special instrument Requirements:
   Not applicable

H. Device Description:

Each VITEK®2 test card contains 64 microwells. A control well, that contains only microbiological culture medium is resident on all cards, with the remaining wells containing premeasured amounts of a specific antibiotic combined with culture medium. A suspension of organism is made in 0.45-0.5% sterile saline from a pure culture and standardized to a McFarland 0.5 standard using the DensiChek. The desired card(s) are placed in the cassette along with an empty tube for the susceptibility card. The cassette is placed in the VITEK®2 instrument where a susceptibility test will be automatically diluted from the ID suspension by the VITEK®2. The cards are then automatically vacuum filled; the tubes are cut and the cards sealed prior to proceeding to the Incubator Loading Station. Cards are then transferred from the cassette into the carousel for incubation (35.5^{o} C) and optical scanning during testing. Readings are performed every 15 minutes.

In addition to the automatic dilution, there is also a manual inoculation dilution procedure described in the packager insert.

I. Substantial Equivalence Information:

1. Predicate device name(s):
   VITEK®2 Gram Negative Susceptibility Card for Cefpodoxime
2. Predicate K number(s):
   N50510/S120
3. Comparison with predicate:

Similarities		
Item	**Device**	**Predicate**
Intended Use	Same	Same
Test organism	Colonies of Gram-Negative bacilli	Same
Test Card	VITEK®2 card format with base broth	Same
Instrument	VITEK®2 System	VITEK®2 System
Differences		
Item	**Device**	**Predicate**
Antibiotic	Moxifloxacin at specific concentrations	Cefpodoxime at specific concentrations
Reading algorithm	Unique for Moxifloxacin	Unique for cefpodoxime

J. Standard/Guidance Document Referenced (if applicable):

Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test

(AST) Systems; Guidance for Industry and FDA"; NCCLS M7 (M100-S13) "Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Approved Standard".

K. Test Principle:

Optics systems use visible light to directly measure organism growth. These transmittance optics are based on an initial light reading of a well before significant growth has begun. Periodic light transmittance samplings of the same well measure organism growth by how much light is prevented from going through the well. An interpretive call is made between 4 and 16 hours for a "rapid" read but may be extended to 18 hours in some instances. The VITEK®2 Susceptibility Card test is based on the microdilution minimum inhibitory concentration technique with concentrations equivalent to standard method concentrations. Several parameters based on the growth characteristics observed are used to provide appropriate input for the MIC calculations. Discriminate analysis is used to develop the algorithm that determines the susceptibility result for all antimicrobials on the VITEK®2 system. The MIC result must be linked to organism identification in order to determine a category interpretation. A category interpretation will be reported along with a MIC.

L. Performance Characteristics (if/when applicable):

1. Analytical performance:
   - *a. Precision/Reproducibility:*
     Twenty-five gram-positive on-scale organisms were tested at three sites with >95% reproducibility. These same organisms were also tested at one site three times with >95% reproducibility. This testing was performed using both the manual dilution of the inoculum and also the automatic dilution method.
   - *b. Linearity/assay reportable range:*
     Not applicable
   - *c. Traceability (controls, calibrators, or method):*

ORGANISM	***VITEK®2 Conc. (ug/mL)***	***VITEK®2 Auto***	***VITEK®2 Manual***	***Reference Conc. (ug/mL)***	***Reference***
E. coli					
ATCC 25922	≤0.25	80	70	≤0.06	150
Expected Range:					
≤0.06 µg/mL					
P. aeruginosa	1	7	21	1	13
ATCC 27853	2	52	44	2	117
Expected Range:	4	21	5	4	20
1 – 8 µg/mL	8			8	

Quality Control was performed during the studies using both the auto-dilution and the manual method of diluting the organisms. Results demonstrated that methods were comparable with the same mode.

Inoculum density control was monitored using the DensiChek instrument. This was standardized weekly with all results recorded and in the expected range. Verification was performed during internal testing.

d. Detection limit:
Not applicable

e. Analytical specificity:
Not applicable

f. Assay cut-off:
Not applicable

2. Comparison studies:

a. Method comparison with predicate device:
A clinical study was conducted at three sites using the VITEK®2 cards with moxifloxacin and the NCCLS reference agar dilution method prepared as recommended in NCCLS M7 approved standard. Inoculum was prepared with direct colony suspension. Two methods of inoculation (manual and automated) were evaluated. Clinical testing was performed using the automated method of inoculation and the challenge set was tested using both the manual and the automated method. Greater than 99% of the isolates grew in the VITEK®2 cards in less than 16 hours.

The following table provides the results from the automated testing.

	Total	**EA**	**%EA**	**Total evaluable**	**EA of evaluable**	**%EA**	**CA**	**%CA**	**#R**	**Min**	**maj**	**vmj**
Clinical	599	591	98.7	83	76	91.6	594	99.2	52	5	0	0
Challenged	83	82	98.8	27	27	100	73	88	19	10	0	0
Combined	682	673	98.7	110	103	93.6	667	97.8	71	15	0	0

EA-Essential Agreement
CA-Category Agreement
R-resistant isolates
maj-major discrepancies
vmj-very major discrepancies
min- minor discrepancies

Evaluable results are those that fall within the test range of the reference method and could also be on-scale with the new device if within the plus/minus one well variability. EA is when there is agreement between the reference method and the VITEK®2 within plus or minus one serial two-fold dilution of antibiotic. CA is when the interpretation of the reference method agrees exactly with the interpretation of the VITEK®2 results.

There are no vmj errors and no maj error. There are 15 min errors *yielding* a min error rate of 2.2%. All min errors are in essential agreement. There seems to be a trend for the VITEK®2 result to be more resistant so most of the minor errors are one well more resistant but still in EA.

Manual Dilution:
The challenge set of organisms was also tested at one site using the manual method of inoculation with the following performance that demonstrated that there was little or no difference between the two inoculation methods.

	Total	**EA**	**%EA**	**Total evaluable**	**EA of evaluable**	**%EA**	**CA**	**%CA**	**#R**	**min**	**maj**	**vmj**
Challenge	83	81	97.6	25	25	100	74	89.2	19	9	0	0

b. Matrix comparison:
Not applicable

3. Clinical studies:
   a. Clinical sensitivity:
   Not applicable
   b. Clinical specificity:
   Not applicable
   c. Other clinical supportive data (when a and b are not applicable):
   Not Applicable
4. Clinical cut-off:
   Not applicable
5. Expected values/Reference range:
   Enterobacteriaceae ≤2(S), 4(I), ≥8(R)
   The interpretative criteria and QC are the same as recommended in NCCLS. All values will be included in the package insert.

M. Conclusion:

The reproducibility, quality control results and overall performance is acceptable as described in the "Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems; Guidance for Industry and FDA" which was used in the design and evaluation of the study. The appropriate control organisms are included in the labeling and are the same as those recommended in the NCCLS M7-(M100-S13) document. This performance as compared to a standard method demonstrates substantial equivalency to the predicate.